CLAIMS

1. A solution process for polymerizing one or more α-olefins of the formula CH_2=CHR, where R is H or an alkyl radical C_1-C_{18}, to produce a polymer that is soluble in the reaction medium, comprising the steps of:
   a) continuously polymerizing in a liquid phase the α-olefin in the presence of a catalyst system based on a transition metal compound to obtain a solution of polymer in the reaction medium;
   b) the polymeric solution obtained from step a) is then mixed in one or more mixing stages with an aqueous mixture comprising one or more organic compounds having at least a hydroxy or epoxy group, said aqueous mixture having a dynamic viscosity at 30°C higher than 50 cP (centiPoise).
2. The process according to claim 1, wherein said α-olefin is butene-1.
3. The process according to anyone of claims 1-2, wherein a solution of polybutene-1 in butene-1 is obtained from step a).
4. The process according to anyone of claims 1-3, wherein the polymerization step a) is carried out at a temperature in the range of from 65 to 85°C.
5. The process according to anyone of claims 1-4, wherein the polymerization step a) is carried out at a pressure comprised between 8 and 40 bar.
6. The process according to anyone of claims 1-5, wherein the polymerization step a) is performed in one or more continuously stirred tank reactors.
7. The process according to anyone of claims 1-6, wherein in step a) the concentration of polybutene-1 in butene-1 is kept to a value of less than 35% by weight, preferably between 10 and 30% by weight.
8. The process according to anyone of claims 1-7, wherein in step a) butene-1 is polymerized in the presence of up to 20% by weight, preferably 0,5-10% by weight based on butene-1, of another α-olefin.
9. The process according to anyone of claims 1-8, wherein a polymeric solution having a temperature in the range of 65-85°C and a dynamic viscosity in the range of 1000-80000 cP is fed to the deactivation step b).
10. The process according to anyone of claims 1-9, wherein the dynamic viscosity at 30°C of the aqueous mixture of step b) is higher than 90 Cp.
11. The process according to anyone of claims 1-10, wherein the components of the

aqueous mixture of step b) are mixed together in a separated vessel at a temperature in the range of 25-45°C before the feeding to the deactivation step b).

12. The process according to anyone of claims 1-11, wherein the aqueous mixture as defined in step b) comprises one or more organic compounds selected from polyalcohols, hydroxyesters, alkyldiethanolammines, polyepoxydate oils.

13. The process according to claim 12, wherein said aqueous mixture comprises one or more alkyldiethanolammines of formula R-N $(CH_2CH_2OH)_2$, wherein R is an alkyl radical C_{12}-C_{18}.

14. The process according to claim 13, wherein the molar fraction of said alkyldiethanolammines in said aqueous mixture is comprised in the range of from 0.1 to 0.4.

15. The process according to anyone of claims 1-14, wherein the catalyst system of step a) is a Ziegler-Natta catalyst comprising a Ti-based compound as the solid catalyst component and an Aluminum alkyl compound as an activator.

16. The process according to anyone of claims 1-15, wherein in step b) the ratio between moles of aqueous mixture (water+organic compounds) and moles of Al is higher than 2.0.

17. The process according to claim 16, wherein said molar ratio is comprised between 2.5 and 4.0.

18. The process according to anyone of claims 1-17, wherein step b) is carried out in one or more mixing tanks placed in series.

19. The process according to anyone of claims 1-18, wherein step b) is carried out in a single deactivation apparatus equipped with a sequence of mixing stages.

20. The process according to claim 19, wherein the deactivation apparatus comprises a stirring shaft provided with impellers in a number comprised between 2 and 20.

21. The process according to claims 19-20, wherein said mixing stages are formed along the shaft of the apparatus by the rotation of each impeller.

22. The process according to claims 19-21, wherein the impellers are equipped with radial blades fixed at the stirring shaft, said radial blades causing a radial flow inside each mixing stage.

23. The process according to claims 1 and 19-22, wherein said polymeric solution and said aqueous mixture are continuously fed at the inlet of said deactivation apparatus

and flow slowly through the sequence of said mixing stages.

24. The process according to anyone of claims 1-23, wherein downstream step b) the solution of polybutene in butene-1 is passed to a separation step, wherein the polybutene-1 is separated from the unreacted monomer, which is recovered and re-circulated to the polymerization step a).

25. The process according to claim 24, wherein said separation step is carried out in one or more volatilization chambers operating at a decreasing pressure.